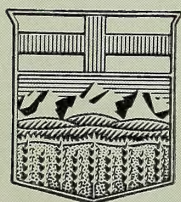
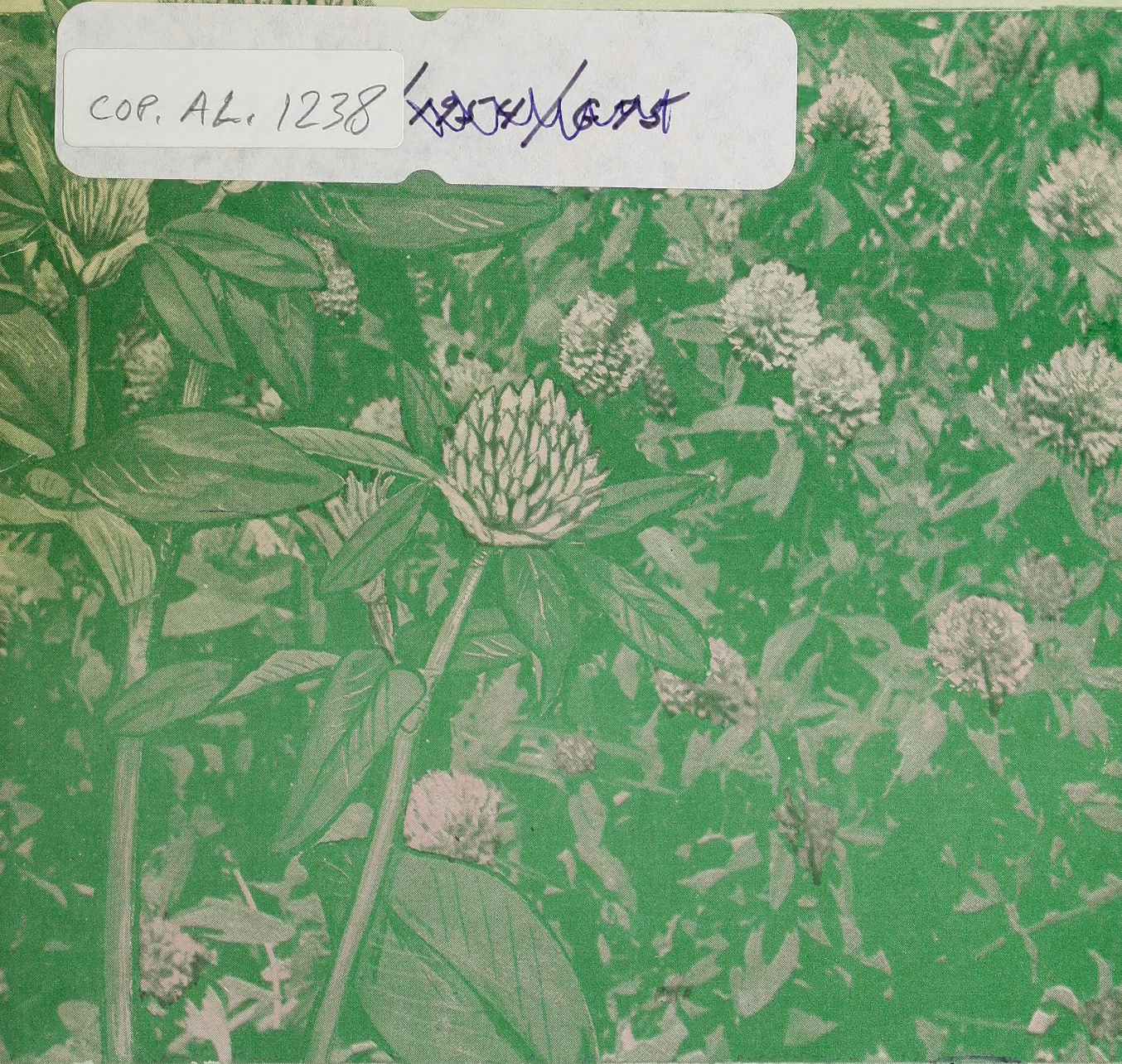


GRASS AND LEGUME SEED CROPS *for* ALBERTA

PREPARED BY THE ALBERTA FORAGE CROPS ADVISORY COMMITTEE

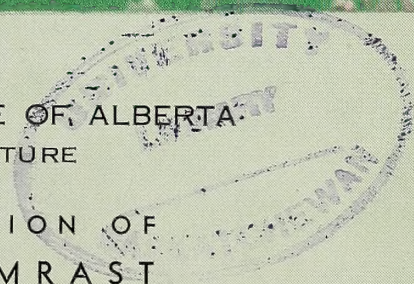
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GOVERNMENT OF THE PROVINCE OF ALBERTA
DEPARTMENT OF AGRICULTURE

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GRASS AND LEGUME SEED CROPS FOR ALBERTA

Prepared by The Alberta Forage Crops Advisory Committee

LAND

Grass and legume seed production has now become an established enterprise on many farms in Alberta. Production of these crops is generally localized. Legume seed production has been profitable, particularly to farmers on the grey wooded soils. These soils require the soil enrichment capabilities of legumes if satisfactory yields of cereals are to be realized. Hence, legume seed production fits in well with a crop rotation for the grey wooded soils. Production and marketing being somewhat erratic *for grass and legume seeds*, the wise farmer will not depend wholly upon them for his livelihood. With some of the forage seed crops, by-products of seed production can be profitably used through livestock.

If good seed is sown on weedy land, the extra cost of the seed has been lost. Quality seed cannot be produced if the land contains weeds that cannot be cleaned out of the crop. The seed producer cannot afford to take chances by sowing his crop on weedy land. Clean seed, grown on clean land, will produce a seed crop requiring little processing to get it in shape for grading and marketing, and so a greater profit will be realized. Good, clean grain stubble is a desirable seed bed in areas where soil drifting is a menace. Stubble also holds snow, adding to spring moisture, gives sun and wind protection to the small forage seedlings, and assures a firm seed bed.

SEED

In any enterprise, quality of the product determines, to a large extent, the returns to the producer. Forage seed is no exception, and the sale of high quality seed is a must for continued success. The seed the grower sows must be of the highest quality available. Only registered and certified seed should be considered by the grower for planting. It is inspected in the field and in the sack, and is guaranteed to be of high quality and purity. Any seed offered for sale must be graded in accordance with the standards described in "The Seeds Act". Any seed that does not meet these minimum standards cannot be sold or advertised as seed. All seed growers are advised to get a copy of this Act from the Plant Products Division, Canada Department of Agriculture, and study the tolerances allowed for various seed grades.

SEEDING

A good rule is never to sow forage seed deeper than one-half to three quarters of an inch. A firm, moist, weed-free seed bed is required.

A special forage seeder, such as the one illustrated, is a wise investment if the farmer is planning to seed large acreages, or if his rotation plan calls for forage seedings every year. Many farmers have found a press drill to be satisfactory. The usual procedure is to take all the pressure off the disks and let the packer wheels cover the seed. Drill disks equipped with depth regulators will give a more uniform seeding depth. Broadcasting of seed is never as satisfactory as drilling because of uneven seeding and poor coverage. It should be done only on rough, uneven land, or land too



Such a seeder does a good job of seeding, but may pulverize the soil, making it more subject to erosion.

Photo—Lacombe Experimental Station, Lacombe.

loose for the drill. Harrowing and packing following broadcast-seeding are essential.

COMPANION CROPS

The use of a companion crop is not advisable in the drier areas, and even in the moister areas it will compete with the forage crops and a weaker stand will result than if the forage seed were sown alone. Frequently, weeds are a problem if a companion crop is not used. Broad-leafed weeds, susceptible to 2,4-D, can be controlled in grass seedings by spraying with recommended rates of this chemical. Legume seedings cannot be treated with 2,4-D because they are susceptible. However, the chemical M.C.P., a compound quite similar to 2,4-D, is available. It has proved to be less injurious to alfalfa, alsike, and red clover. M.C.P., at 2 to 4 ounces per acre, can be used on strong stands of these crops to control

susceptible broad-leafed weeds. Sweet clover is susceptible to M.C.P., and this crop should not be treated with either 2,4-D or M.C.P.

Some farmers sow these small seeded crops in mixture with the companion crop. Constant mixing is required during seeding, and even then, uneven seeding of the small seeds results. When seeding in this manner, time, depth, and moisture conditions of the soil should be those most favorable for the forage crop. It is more desirable to seed the companion crop in a separate operation. The companion crop should be sown at one-half the usual rate and at the normal depth. The forage crops may then be seeded at the optimum depth, which is usually one-half inch. Flax is usually the most satisfactory companion crop, except on irrigated land, where it depresses the forage stand. The cereals rank in this order of desirability : wheat, oats, and barley.

SEED INOCULATION

Legume seeds should always be inoculated with the correct inoculum. When buying inoculum, always specify the crop for which it is desired. This inoculum contains the bacteria which live in the roots of the legume plant. They are able to take nitrogen from the air and make it available to the legume plants. Inoculated legume seed should never be mixed with seed treated with Ceresan or other mercury dusts, nor should it be mixed with fertilizer.

SEED TREATMENT

Legume seed can be treated with some of the newer non-mercurial fungicides, such as Sperguson, Arasan, and Orthocide. This should be done well before seeding, and the seed inoculated just a few hours before seeding.

Grass seed can be treated with Arasan at the rate of ten ounces per hundred pounds, at least twenty-four hours before seeding.

ROW SEEDING

Row seedings of most of the forage crops will produce a larger yield of better quality seed for a longer period of time than solid seedings. An operator must satisfy himself that the increased returns are worth the trouble of cultivating and the expense of row cultivating equipment. The grower who expects to continue grass or legume seed production for a period of years, would be well advised to go to the extra trouble and expense involved in row plantings. Where grass rows are swathed, the swaths will be difficult to pick up.

Spacing of rows at 12 to 14 inches apart, such as would be obtained by plugging every second drill run, has given good results in

the production of alfalfa and grass seeds, and does not involve row cultivation or create pickup troubles.

TIME OF SEEDING

In areas where moisture is not a limiting factor, forage seedings can be carried out any time during the growing season, provided sufficient time remains of the growing season so that the crop can establish itself. Early fall seedings of most legumes usually fail because the seedlings winter kill. In drier areas, early spring or summer-fallow seedings are the surest. Seedings of grasses and alfalfa can be made in the late fall after freeze-up, enabling the seedlings to take advantage of spring moisture. This is not advised where land is weedy or the soil is not well prepared. In the dry areas, early fall seeding is probably best and most suited for the grasses, with the main hazard being grasshopper outbreaks. Late fall seedings or those made just before freeze-up, and very early spring seedings, are usually successful.

On irrigated land, time of seeding is not quite as important. We have good results from late summer or early fall seeding. By this, we refer to the middle of August. Seeding at this time usually results in a good stand before winter. On very rare occasions, when winter killing occurs in these new stands, it is possible to reseed the following spring.

Forage seedings will be most successful when there is adequate moisture. The seedlings are very small and not nearly so hardy as cereal seedlings. Conditions must be made as favorable as possible if a successful stand is to be grown.



A good stand of Creeping Red Fescue.

Photo—Lethbridge Experimental Station.

USE OF FERTILIZERS

In some of the seed producing areas of Alberta, the use of commercial fertilizer will result in substantial seed increases in seasons when moisture conditions are satisfactory.

The use of sulphur-bearing fertilizers on legume seed crops in the sulphur-deficient, grey wooded soil regions of west and north-central Alberta is almost an essential for successful production in that area. Phosphorous applied with the sulphur usually results in an additional increase in seed yield, pro-

vided, of course, that pollinating insects are plentiful. Barnyard manure is also very effective in promoting vigorous stands, and subsequently increasing legume seed yields on grey wooded soil.

Provided that moisture conditions are favorable, nitrogen fertilizers are usually effective in increasing seed yields of the grasses, particularly when the stands have become sod-bound. Barnyard manure is also effective.

The following fertilizers and rates of application are recommended :

Legumes (Grey wooded soils of west-central and north-central Alberta)

Ammonium Phosphate, 16-20	50 to 60 lbs. per acre
Ammonium Sulphate	30 to 50 lbs. per acre
Sodium Sulphate	30 to 50 lbs. per acre
Gypsum	40 to 60 lbs. per acre

(Grey wooded soils of Peace River District)

To date, legumes in the Peace River district have not responded to fertilizer.

Grasses (Black, degraded black, and grey wooded soils)

Ammonium Nitrate (nitraprills)	150 to 200 lbs. per acre
Ammonium Sulphate	150 to 300 lbs. per acre

Ammonium Sulphate is recommended for grasses on sulphur deficient grey wooded soils of west-central and north-central Alberta.

Well rotted barnyard manure should be applied uniformly at a rate of 10 to 15 tons per acre.

Fertilizers are best applied to legume crops early in the spring, but late fall applications have given similar results in some seasons. Early spring is also one of the best times for fertilizing the grasses. Preliminary testing indicates, however, that early fall fertilizing of grasses for seed production may be more beneficial than early spring applications.

With heavy production on irrigated land in southern Alberta, all crops respond to proper fertilizers. Legumes are particularly heavy users of phosphates, and fertilizers containing a high percentage of phosphates are recommended for their use. Ammonium Phosphate,

11-48-0, at 50 to 100 lbs. per acre, is a common application on alfalfa and clovers. Grasses respond more readily to nitrogenous fertilizers. Ammonium Phosphate, 11-48-0, Ammonium Nitrate (nitraprills), and Ammonium Sulphate each give good response when used at 50 to 100 lbs. for grass crops. For specific recommendations, see Circular No. 5, "Fertilizers in Alberta".

ROGUING

Roguing refers to the removal of weeds, off-type plants, and other objectionable plants from the seed field. This is usually done by hand, and often amounts to considerable work. In most cases, it is a necessary procedure, as it is possible to eliminate seed contamination by roguing the plants of which the seed cannot be removed by cleaning. A good example of this is the removal of sweet clover plants from other legume crops so that little or no



Crested Wheat Grass in rows.

sweet clover seed gets into the harvested seed crop.

HARVESTING

It is now common practice to use the combine for harvesting grasses and legumes, though more seed may be saved through the use of the stationary thresher. Most operators are not in a position to own both a combine and a threshing machine. With one or two exceptions, only grasses that do not shatter readily should be straight combined. The seed should be dried before storage. Drying can be done by spreading the seed in thin layers, or using a drying machine. More legume seed will be saved by swathing and combining than if straight combining is practised. For swathing red and alsike clover crops, a satisfactory method is cutting with a mower equipped with a windrower. In heavy stands, a special dividing board, similar to that used in pea harvesting, may be required. The most effective type of windrower is the centre delivery. Most operators find that when using a centre delivery windrower on a heavy crop, it is advisable to remove one bar from each side of the opening. This leaves a wide, flat windrow that will dry quickly.

Every year, a large acreage of swathed clovers is lost, due to wind. Much of this loss could be avoided by cutting the crop while the leaves and stems are still green. This will give a swath which will pack down and knit closely during drying. Some growers have found a swath packer, pulled directly behind the mower or swather, reduces the damage caused by wind. One suggestion for a packer is a piece of fairly heavy sheet metal, turned up at the end like a toboggan, so it will slide easily over the swath. Another type is an old gas barrel, mounted so as to roll over and pack the swath.

In picking up from the swath, watch the speed of the pickup — if it travels too fast, it tears the swath apart and a large amount of seed is lost.

For alsike and Altaswede clover, put pickup guards every third or fourth space on the cutter bar. The swath is lifted by these large guards, on to the combine table. Those using this method feel that less seed is lost than with the conventional type pickup.

It is important, regardless of what kind of implement is used in cutting, to keep the speed of travel



Wind damage of clover cut when over-ripe.

Photo by B. T. Stephanson.

down. Far less seed will be lost at 1 to 1½ miles per hour than at 4 or 5 miles per hour.

Swathing and pickup combining has largely replaced the binder and threshing machine in the harvesting and threshing of grass and legume seed crops.

THRESHING

For threshing all forage crops, the rub-bar cylinder is better than the toothed type. The rub-bar cylinder does not break the straw nearly so much, and with less straw in the threshed sample, the seed is easier to clean.

Don't overload the machine. Slow, uniform feeding is important. Best results with a combine will be obtained by the use of an auxiliary motor.

See that correct adjustments are made for wind, cylinder speed and concave clearance. You may need extra equipment for satisfactory operation — equipment such as special concaves, sieves and screens, fan sprockets for reducing fan speed, and sprockets for speeding up the cylinder while maintaining normal speed of other parts of the machine.

Before you start to thresh, check the cylinder for alignment and freedom from end-play. Rub-bar cylinders are sometimes damaged by small stones which dent the bars. Check for this also.

Watch carefully for leaks. The small seeds of forage crops will pass through a much smaller opening than will a kernel of wheat.

There are two ways in which losses of seed can occur in the threshing operation :

1. Incomplete threshing from the head. In this case, increase cylinder speed or set the concaves closer. You may have to do both.

2. Seed blown over with the straw and chaff. To reduce the loss of seed in the straw, reduce the volume going into the machine or open the concaves to avoid breaking up the straw. To reduce the loss of seed in the chaff, reduce the wind or direct it forward on the sieves.

Watch the shoe closely. No combine will handle more than the shoe can carry.

THRESHING GRASS SEED

When threshing grass seeds, try to thresh out the seed without breaking the stems into small pieces. You can do this by reducing the speed and using few concaves. Under dry conditions, thresh when slightly moist from dew or a light shower. If you can avoid breaking the stems, the straw will stay on the straw racks; the load of broken material on the chaffer and grain racks will be reduced; you will turn out a cleaner sample, and with lower wind blast needed, there will be less seed carried into the blower.

THRESHING LEGUME SEED

In threshing legume seeds, higher cylinder speed and more concaves are needed. The problem is to thresh the seed out of the pods. The crop should be as dry as possible to prevent heavy losses from the seed going over. The straw of some legumes breaks very easily. You may have to use a wire mesh, or other device, over the straw rack so that too much broken straw does not pass through with the seed and overload the shoe. One advantage of the threshing machine compared with the combine is that the straw may be put through the separator a second time if it contains too much seed. In seed producing areas in California, combines have been modi-

SUMMARY

CROP	PLANT CHARACTERISTICS	WHERE GROWN	SEEDING DEPTH & RATE	SPECIAL WEED PROBLEMS	SPECIAL FACTORS	HARVESTING
BROME GRASS	Long-lived perennial; extensive creeping coarse root system; very leafy, tall. Good seed yielder.	Areas of ample rainfall.	Solid 6 - 8 lbs. $\frac{1}{2}$ " - 2" deep. Rows not recommended. Firm moist seed bed.	1. Couch Grass 2. Stick seed 3. Slender wheatgrass 4. Western wheat	Becomes sod bound—use only certified couch-free seed. Check stored seed for heating.	Straight combine or swath and combine or bind and thresh.
CRESTED WHEATGRASS	Long-lived perennial; extensive tough fibrous roots; resistant to decay; not creeping. Fairly leafy. Medium tall. Very good seed yielder.	Throughout Alberta, but as it is drought resistant, is important, in drier areas.	6 - 10 lbs. solid; 5 - 6 lbs. - 12" - 14" rows. Firm, moist seed bed, not deeper than $\frac{1}{2}$ ".	As in Brome	Shatters readily. Use lifting guards for row planting.	Bind or swath when heads are mostly brown with slight greenish color. Straight combine or swath and combine.
CREeping RED FESCUE	Long-lived perennial; with creeping roots. Bunch grass type of growth. Leafy; short.	Areas of higher rainfall. Peace River; Olds; irrigated areas; foothills.	2 - 4 lbs. solid to 12" spacing. Firm, moist seed bed not deeper than $\frac{1}{2}$ ".	Couch and other grasses; cinquefoil.	Not reliable seed yielder in all areas. Check stored seed for heating.	Draw several heads through the hands. If loose seeds—swath and combine or straight combine.
TIMOTHY	Short-lived perennial; not creeping; fairly leafy; tall.	Black soil areas.	3 - 5 lbs. per acre solid. Firm, moist seed bed not deeper than $\frac{1}{2}$ ".	Small seeded false flax. Cinquefoil. Pepper Grass. Shepherd's Purse. Stinkweed. Canada Thistle.	Seed shatters readily. Care must be taken not to hull the seed when threshing.	Swath and combine or bind and thresh.
REED CANARY	Long-lived perennial; creeping roots; tall; coarse stems.	Wide adaptation; withstands prolonged flooding. Moderate tolerance to alkali.	3 - 5 lbs. per acre solid. 1 - 2 lbs. per acre. 24" - 36" rows.	Curled Dock. Lady's Thumb. American Slough Grass.	Shatters very readily. Hulls easily; requires care in threshing. Check stored seed for heating.	Straight combine.

SUMMARY

CROP	DESCRIPTION	WHERE GROWN	SEEDING DEPTH & RATE	SPECIAL PROBLEM WEEDS	SPECIAL FACTORS	HARVESTING
ALFALFA	Long-lived perennial; deep tap root; recommended varieties are winter hardy. Tall.	All but driest areas.	Solid 4 - 6 lbs., not over 1/2" deep. 4 lbs. - 12" rows. Inoculate seed.	<ol style="list-style-type: none"> 1. Sweet Clover 2. Night-flowering Catchfly 3. Ball Mustard 4. Wild Mustard 5. Russian Thistle 6. Russian Pigweed 7. Stinkweed 8. American Dragon-head 	Requires wild bees for effective cross pollination.	Swath and combine or bind and thresh.
RED CLOVER	Short-lived perennial; tap root; not completely winter hardy; tall.	Grey wooded, black and brown soils. Higher rainfall areas of good drainage.	Solid - 4 to 5 lbs., not over 1/2" deep. Inoculate. Spring pasturing will reduce seed yield.	<ol style="list-style-type: none"> 1. Sweet Clover 2. Wild and Ball Mustard 3. Night-flowering Catchfly 4. Green Foxtail 5. Curled Dock 6. Russian Pigweed 	<p>Red, Alsike & Sweet Clover seed yields can be increased by placing one or more hives of honey bees per acre.</p> <p>More than one hive per acre may increase seed yield, but honey production per hive will be less.</p>	Swath, mower with windrow attachment. Combine. Considerable seed can be saved by catching and re-threshing the straw and tailings.
ALSIKE	Short-lived perennial; tap root; not completely winter hardy; short.	Grey wooded and black soils; higher rainfall areas. Withstands some flooding.	Solid - 3 to 4 lbs., not over 1/2" deep. Inoculate.	<ol style="list-style-type: none"> 1. Night-flowering Catchfly. 2. Lamb's Quarters 3. Red Root Pigweed 4. Small Seeded Weeds 		
SWEET CLOVER	Biennial; tap root; coarse, tall growth.	Throughout Alberta. Has some tolerance to alkali.	8 - 10 lbs., scarified seed per acre for solid seedings; not over 1/2" deep.	Same weed as in Alfalfa.	Hard seeds contaminate fields. Should not be grown in areas where other legume crops are grown for seed.	Swath and combine.



Straight combining brome; special care must be taken to prevent spoilage of seed in storage.

Photo — Beaverlodge Experimental Station.

fied so that the straw and chaff are put in tight wagons. Later, this material is rethreshed and considerable seed saved.

The small size and light weight of grass and legume seeds make separation especially difficult. There are times when the operator must choose between considerable loss of seed and a poorly cleaned sample. A good rule is to save as much seed as possible, and reclean later. At normal price levels, a few pounds of seed saved will pay for a lot of cleaning.

CLEANING THE MACHINE

Thorough cleaning of machines and racks is extremely important. It takes only two sweet clover seeds in one ounce of another registered legume seed crop to spoil it for registration. When cleaning the threshing machine, pay special attention to the augers. They can hold large quantities of

seed that may mix with the next lot threshed.

COMBINE SETTINGS

It is suggested that growers follow the settings recommended by the manufacturer for any specific combine. Machine specialists point out that cylinder speed is not as important as the periphery speed of the cylinder. As the periphery speed depends on the cylinder diameter, and as the cylinder diameter of different makes of combines is not the same, it is readily seen that cylinder speeds vary greatly.

SEED STORAGE

With the greater amount of direct combining that is now being done, serious losses from seed heating in storage are more frequent. Seed should be stored where it can be examined daily.

There should be free air circulation around the seed. A good method is to sack the seed and stand the sacks separately in a machine shed or other large building. Safer still, seed may be spread out on the granary floor and turned once or twice a day. Spoilage can be cut down by putting the seed over the fanning mill to remove green material.

Seed should be stored only in clean, tight granaries and sacks. Contamination of clean seed when it is almost ready for market is costly.

Mice often cause damage to stored seeds. There are a number of practices that will curb this loss. The rat poison, "Warfarin", is effective against mice, and filled bait containers set about the storage area will usually solve the problem. Lime, sulphur and salt mixture, sprinkled under and around sacks of seed, will act as a repellant.

SEED CLEANING

It is almost impossible with average farm equipment to clean grass and legume seeds to a recognized seed grade. The best way is to attempt only rough cleaning on the farm. For final cleaning and grading, the seed can be shipped to one of the commercial concerns operating an efficient, well equipped plant. A few pounds of seed saved in this way, with the possibility of a higher grade, will easily pay shipping and cleaning costs.

POLLINATING INSECTS

Commercial seed production of alfalfa, alsike and red clover depends upon the activity of pollinating insects. Bees are by far the most important pollinators of legume flowers.

CLOVERS

Honey bees are effective in pollinating the clovers, and seed yields can be increased through the placement of honey bee



Sweet Clover in the swath.

Photo — Beaverlodge Experimental Station.

colonies on the field during blooming time. One hive or more per acre can be used; honey yields per hive will probably be lower with more hives per acre. However, profitable seed increase could probably be realized with up to three hives per acre.

In years when wild bee populations are high, honey bees will not be so effective in raising seed yields.

Red clover blossoms are more difficult for the bees to work than are alsike and sweet clover flowers. Consequently, red clover fields should be as far away as possible from these competing crops.

ALFALFA

Alfalfa seed yields in Alberta have not been increased through the use of honey bees, as the alfalfa flowers are difficult for honey bees to "trip". There are many other flowers that honey bees have less difficulty in working.

Wild bees are necessary for satisfactory seed yields of alfalfa. A number of species of leaf cutter and bumble bee are important trippers of alfalfa. The numbers of these bees fluctuate widely from year to year. In years when they are numerous, alfalfa usually sets seed readily.

Mechanical tripping devices, chemical tripping sprays, log chains, stone boats and barbed wire, dragged over alfalfa fields, can do no good, and will only injure the growth. The slightest injury to the flower causes it to wilt and drop. For the present, the job must be left to the wild bees.

CONDITIONS SUITABLE TO WILD BEES

Leaf cutter bees nest in old logs, hard places in the ground, and in native sod. Some species of bum-

ble bee nest above ground and others below ground. In both cases, breaking up of the soil and clearing the brush destroys many nesting sites available to the bees, and a reduction in population is bound to occur. A small field that is producing seed abundantly should be left small. Enlarging of the field will only destroy the nests of the bees, and a lower bee population will result. There will be fewer bees to work more alfalfa, and yields will, of course, drop. Mice are predators of bees, and any practice that will reduce mouse infestation will aid in the establishment of wild bees.

Insects Causing Losses in Forage Seed Production

LYGUS BUG



Adult lygus bug.

Photo — Dr. G. A. Hobbs, Science Service,
Lethbridge

DESCRIPTION

Adults 3/16" long, about one-half as wide. Color varies from pale green to reddish or dark brown. This insect goes through five stages before becoming an adult. The adult has a half diamond mark on the back, which makes it easily identified. The

smaller green "nymphs", as the young are called, have five black spots located on the back.

DAMAGE

The bugs feed on the plant juice in the buds, flowers and developing seeds of alfalfa. No reports have been made of damage in alsike and Altaswede clover, but ladino clover is subject to damage, so it can be surmised that they may also cause seed loss in alsike and Altaswede crops. The insect-damaged buds and flowers soon die and drop to the ground. The injured seed dies, and at harvest time the resulting dry, shrivelled seed is often seen. With a high population of these insects, seed yields can be reduced considerably. Workers in Utah have reported that they increased seed yields in one field from twenty-two pounds per acre to one hundred and sixty pounds per acre by controlling lygus bugs. The life cycle of this pest is completed in six to seven weeks; consequently, it should not reach such high numbers in Alberta as in the United States seed producing areas, where the growing season is much longer and two or three generations may be produced before alfalfa flowering takes place.

CHECKING FOR LYGUS BUGS

Fields should be checked for lygus bugs, one, two and three weeks before the major flowering period. In order to determine if lygus bugs are present in the field, it is necessary to take a sweep with a standard 15" insect net. A white sack, held open by a wire loop 15" across, will work satisfactorily. A sweep with the net is accomplished by swinging the net at arms' length, through the top growth of the vegetation, through a 180 degree arc. Stand facing south with the net in the right hand pointing west. Now, with the net well down

in the growth, hold the arm stiff. Turn and face north. Count the number of lygus and nymphs caught in the sweep. Turn the net inside out so lygus captured will not be counted again. Move ten or twenty feet away and repeat. Carry out ten or twenty such sweeps, keeping track of the total number of lygus captured; divide the total number of lygus caught by the number of sweeps. This is the average number of lygus per sweep. If at any time an average of four lygus or more per sweep is obtained, it will usually pay to employ control measures.

CONTROL

Spraying or dusting with D.D.T. will control lygus bugs during the pre-bloom period, but D.D.T. should not be used during the bloom period because the pollinating insects will also be killed. Toxaphene dust or spray, applied between seven in the evening and seven o'clock in the morning, is recommended for the bloom period. Applying between these hours will kill fewer bees.

D.D.T. should be applied at the following rates :

As a spray, $\frac{3}{4}$ to $1\frac{1}{2}$ pounds of actual D.D.T. per acre in a water emulsion spray.

As a dust, 15 to 20 pounds of 10% D.D.T. per acre should be applied.

Toxaphene is the only chemical that should be applied in the flowering stage. The following rates are recommended :

$1\frac{1}{2}$ pounds actual Toxaphene per acre in a water emulsion, or 20 pounds of 10% Toxaphene dust per acre.

If the lygus population has been exceedingly high, burn the alfalfa stubble the following spring before plants start to grow.

GRASSHOPPERS

These pests can be controlled with Toxaphene at the same rates as used for lygus control. Aldrin and Chlordane are also effective in grasshopper control. These insecticides should be used as follows :

2 to 3 ounces of technical Aldrin per acre, or 8 ounces of technical Chlordane per acre; both in spray form. With dusts, use one and a half to twice as much per acre.

In cases of very heavy infestation, the above rates can be doubled or tripled.

SWEET CLOVER WEEVIL



Adult sweet clover weevil.

Photo — Dr. G. A. Hobbs, Science Service,
Lethbridge

DESCRIPTION

The adult weevil is small, dark grey, about $3/16$ inch long. It has a long snout, which aids in identification. When approached, these weevils drop from the foliage and remain still, consequently, they can easily escape notice.

DAMAGE

The adult weevil is responsible for the major part of the damage to the sweet clover plant. This damage is very characteristic, crescent-shaped pieces being eaten

out of the leaves. In severe infestations, the plants may be stripped of all leaf surface, and the outer bark of the stem chewed. These weevils prefer sweet clover, but will eat alfalfa if sweet clover is not available. Sweet clover field margins usually show the severest damage, because the beetles migrate from second-year stands to new plantings.

CULTURAL CONTROL

Crop rotation, using crops unattractive to the weevil, such as the cereals and grasses.

New plantings should be located a good distance from second-year stands of sweet clover. In the fall, plough down marginal strip of defoliated sweet clover to a depth of six inches. This will bury many bugs which would over-winter. The following spring, this can be sown to a cereal crop.

The most effective means of control is through shallow cultivation of sweet clover hay fields immediately after cutting in July. This, of course, is impossible in fields left for seed, but if damage is severe, the pest will have to be controlled with chemicals. After the seed has been harvested, if weevils have done damage, the field should be ploughed to bury the insects.

CHEMICAL CONTROL

The most effective time for spraying or dusting is in the spring just after the plants have started to grow the second year. This will kill most of the weevils and prevent them from laying eggs.

D.D.T., Chlordane and Toxaphene have been found to be effective. Aldrin should also be effective. It is much more toxic than the other three chemicals, and should be handled with greater care.

RATES

1. Dust 20 pounds of 5% D.D.T. per acre.

2. Spray at rate of 1 pound D.D.T. per acre.

3. 1 pound Technical Chlordane per acre mixed in 8 to 10 gallons of water.

4. 1½ pounds Technical Chlordane dust per acre.

5. 2 pounds Technical Toxaphene per acre in spray form.

NOTE ON CHEMICALS

Growth treated with the insecticides mentioned, should not be pastured. Forage from treated fields should not be fed to milk

cows or meat animals. Always follow the manufacturer's instructions carefully when using chemicals. Legume seed crops should never be sprayed or dusted with insecticides when beneficial insects are present in the field. If at all possible, this spraying or dusting should be done before the plants are in bloom. Where spraying is necessary when a field is in bloom, it should be done in the late evening after the bees have left the fields.

DISEASES

Forage crops are subject to a number of diseases, but we can mention only those which are most important to the seed grower.

DISEASE	CROP	AREA	SYMPTOMS	CONTROL
Bacterial Wilt	Alfalfa	Present throughout most of the alfalfa growing area.	Yellowing of leaves; plants may die; numerous branching and leafing. Dwarfing of plant.	Resistant varieties. VERNAL is resistant.
			When tap root is cut, shows dark ring.	LADAK more resistant than GRIMM.
Winter Crown Rot or Snow Mould	Alsike Alfalfa Red Clover Grasses	North & Central Alberta. Foothills.	Damage to crowns occurs in early spring. Rotting and discoloration of upper part of roots.	
Crown Bud Rot	Alfalfa	Irrigated areas.	Rotting of crowns during growing season.	
Root Rots	Clovers Alfalfa Grasses	Throughout the province.	Killing out of patches. Plants turn yellow; roots and crowns show dark rotting.	Seed treatment. Crop rotation.

This circular has been prepared by the Alberta Forage Crops Advisory Committee, appointed by Honourable L. C. Halmrast, Minister of Agriculture.

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OTHER BULLETINS

Extension Service, Alberta Department of Agriculture—

Circular 63—Hay and Pasture Crops for Alberta.

Department of Extension, University of Alberta, Edmonton—

Bulletin 44 — Cropping for Profit and Permanency.

Bulletin 21 — Wooded Soils and Their Management.

Circular 4 — Legume Inoculation.

Information Service, Canada Department of Agriculture —

Mimeograph — Growing Crested Wheat Grass for Seed.

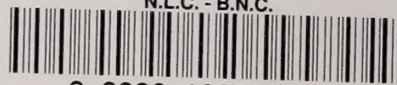
Publication 866 — Brome Grass Seed Production in Western
Canada.

Publication 894 — Red Clover for Hay, Pasture and Seed.



Information can also be obtained from your District Agriculturist; the Field Crops Branch, Alberta Department of Agriculture; Department of Plant Science, University of Alberta, or from your nearest Experimental Station.

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